



# PATENT SPECIFICATION

653,760

Date of filing Complete Specification: May 3, 1949.

Application Date: May 3, 1948.

No. 17004/48.

Complete Specification Published: May 23, 1951.

Index at acceptance:—Class 29, H2(c: h).

## PROVISIONAL SPECIFICATION

### Improvements in or relating to Refrigerators

We, C.S.A. INDUSTRIES LIMITED, a British Company, of Wharf Street, Warwick, and FREDERICK GEORGE MARSHALL, a British Subject, of the Company's address do hereby declare the nature of this invention to be as follows:—

This invention relates to refrigerators, more especially of the kind intended for domestic use, and is more particularly concerned with the cabinets of such refrigerators.

Domestic refrigerators are at present designed and constructed to render them suitable for storing commodities such as food-

considerably smaller dimensions beneath which the power unit of the refrigerating system is preferably disposed. The latter may be of the vapour compression type in which case the power unit will comprise a motor and compressor unit of any desired or normal construction. The refrigerant pipe from the delivery side of the compressor passes through the condenser upwardly to the vicinity of the small chamber where it has an expansion valve connected therein, the pipe thereafter being constructed as an evaporator coil. The latter is wound round the outside of the smaller chamber from one

SPECIFICATION NO. 653760

INVENTOR - FREDERICK GEORGE MARSHALL

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of C.S.A. Industries Limited, a British Company, of Wharf Street, Warwick.

THE PATENT OFFICE,  
21st May, 1951.

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cabinet of which includes two chambers of different sizes the smaller of which is maintained at a temperature below freezing point and the larger at a temperature somewhat above freezing point by evaporation of the refrigerant in a single refrigerating system.

The arrangement is preferably such that the larger chamber is maintained at temperatures in the region of 40° F., for example, for the short term storage of products such as milk, eggs, fats and the like whilst the other is maintained at temperatures around 0° F., for example, for storing foods such as vegetables, fruits, chickens, etc. in the frozen state for indefinite periods.

In one construction of domestic refrigerator according to the invention the cabinet is preferably formed of sheet metal and is of substantially rectangular shape, comprising a relatively large chamber occupying approximately half the volume of the cabinet, that is to say substantially the complete space on one side of the vertical centre line of the front of the cabinet, while the space on the other side is occupied by an upper chamber of

that absorption of heat from the smaller chamber occurs by conduction due to the metal-to-metal contact. A thermostatic switch is preferably provided in association with the evaporator coil in the larger chamber to cut out the electric motor when the temperature in the chamber is at the required value. It will be understood that by reason of the arrangement described the smaller chamber will be maintained at a temperature below freezing point and will form a "deep freeze" chamber while the temperature in the larger chamber may be somewhat above freezing point, corresponding for example to that of the normal refrigerator cabinet.

The front of the cabinet has substantially rectangular openings therein to provide access to the front ends of the refrigerator and "deep freeze" chambers, the metal at the edges of the openings being pressed inwardly to form flanges on which the two chambers, complete with their rear end walls but open at the front, are spigoted so that they extend rearwardly into proximity with

[Price 2/-]



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## PROVISIONAL SPECIFICATION

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We, C.S.A. INDUSTRIES LIMITED, a British Company, of Wharf Street, Warwick, and FREDERICK GEORGE MARSHALL, a British Subject, of the Company's address do hereby declare the nature of this invention to be as follows:—

This invention relates to refrigerators, more especially of the kind intended for domestic use, and is more particularly concerned with the cabinets of such refrigerators.

Domestic refrigerators are at present designed and constructed to render them suitable for storing commodities such as food-stuffs for short periods at temperatures above freezing point, no provision having been made for longer term storage of foods in the frozen state. Hitherto such longer term storage has only been possible in separate specially constructed "deep freeze" apparatus.

The present invention has for its object to provide a refrigerator which will enable storage of commodities simultaneously at different temperatures appropriate to the respective requirements in the same apparatus.

The invention comprises a refrigerator the cabinet of which includes two chambers of different sizes the smaller of which is maintained at a temperature below freezing point and the larger at a temperature somewhat above freezing point by evaporation of the refrigerant in a single refrigerating system.

The arrangement is preferably such that the larger chamber is maintained at temperatures in the region of 40° F., for example, for the short term storage of products such as milk, eggs, fats and the like whilst the other is maintained at temperatures around 0° F., for example, for storing foods such as vegetables, fruits, chickens, etc. in the frozen state for indefinite periods.

In one construction of domestic refrigerator according to the invention the cabinet is preferably formed of sheet metal and is of substantially rectangular shape, comprising a relatively large chamber occupying approximately half the volume of the cabinet, that is to say substantially the complete space on one side of the vertical centre line of the front of the cabinet, while the space on the other side is occupied by an upper chamber of

considerably smaller dimensions beneath which the power unit of the refrigerating system is preferably disposed. The latter may be of the vapour compression type in which case the power unit will comprise a motor and compressor unit of any desired or normal construction. The refrigerant pipe from the delivery side of the compressor passes through the condenser upwardly to the vicinity of the small chamber where it has an expansion valve connected therein, the pipe thereafter being constructed as an evaporator coil. The latter is wound round the outside of the smaller chamber from one end to the other and thereafter the pipe passes into the larger chamber where it is connected to the usual small evaporator coil. Thence the pipe returns to the suction side of the compressor to complete the circuit.

The expansion valve is set so that the temperature of evaporation of the condensed refrigerant is substantially below that in a normal refrigerator, for example -10° F., and the length of pipe wrapped round the small chamber is preferably soldered, brazed or otherwise positively secured thereto so that absorption of heat from the smaller chamber occurs by conduction due to the metal-to-metal contact. A thermostatic switch is preferably provided in association with the evaporator coil in the larger chamber to cut out the electric motor when the temperature in the chamber is at the required value. It will be understood that by reason of the arrangement described the smaller chamber will be maintained at a temperature below freezing point and will form a "deep freeze" chamber while the temperature in the larger chamber may be somewhat above freezing point, corresponding for example to that of the normal refrigerator cabinet.

The front of the cabinet has substantially rectangular openings therein to provide access to the front ends of the refrigerator and "deep freeze" chambers, the metal at the edges of the openings being pressed inwardly to form flanges on which the two chambers, complete with their rear end walls but open at the front, are spigoted so that they extend rearwardly into proximity with

- the rear wall of the cabinet. Both chambers are preferably insulated from the outer cabinet and from each other, it being preferable to provide greater insulation for the "deep freeze" chamber than for the larger chamber. The complete cabinet may be mounted on wheel or ball castor devices to facilitate movement. Hinged doors are provided in the front panel of the cabinet to close the access openings at the front ends of the two chambers, and a removable panel may also be provided in the front of the cabinet to enable access to be had to the power unit of the refrigerator system.
- 15 In an alternative construction the arrange-

ment may be such that the "deep freeze" chamber is only accessible through the normal refrigerator chamber. This may be achieved by providing an inter-communicating door between the two chambers or the "deep freeze" chamber may be located within the normal refrigerator chamber so that the latter will have heat absorbed from it by the walls of the "deep freeze" chamber.

Dated this 1st day of May, 1948.

ARTHUR R. DAVIES,  
Chartered Patent Agent,  
Royal Chambers, Promenade, Cheltenham,  
Agent for the Applicants.

#### COMPLETE SPECIFICATION

#### Improvements in or relating to Refrigerators

- 25 We, C.S.A. INDUSTRIES LIMITED, a British Company, of Wharf Street, Warwick, and FREDERICK GEORGE MARSHALL, a British Subject, of the Company's address do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 30 This invention relates to refrigerators, more especially of the kind intended for domestic use, and is more particularly concerned with the cabinets of such refrigerators.

- Generally speaking, domestic refrigerators are at present designed and constructed to render them suitable for storing commodities such as foodstuffs for short periods at temperatures above freezing point, no provision having been made for longer term storage of foods in the frozen state. However, proposals have been made from time to time to provide domestic refrigerators with two chambers which are maintained at different temperature levels so that articles placed in the chamber which is at the higher temperature may be kept in a cool but unfrozen condition, as usual. Such proposals, however, suffer from the disadvantage that in order to maintain the two chambers at different temperatures from each other a separate refrigeration system is required for each chamber or, alternatively, if a single system is employed somewhat complicated valve arrangements have to be incorporated in the system.

- 60 The present invention has for its object to provide an improved refrigerator which will enable storage of commodities simultaneously at different temperatures appropriate to the respective requirements in the same apparatus.

The invention comprises a refrigerator the cabinet of which includes two chambers of different sizes spaced apart and having separate closure means, such chambers being

served by a single refrigerating system having its evaporator formed as two separate components of different volumetric capacities connected in series with the larger capacity component associated with the smaller chamber and the smaller capacity component associated with the larger chamber, the refrigerating system being arranged in such manner that the refrigerant passes from an expansion valve to the larger capacity component and thence through an unrestricted passage to the smaller capacity component whereby the smaller chamber is maintained at a temperature below freezing point and the larger at a temperature somewhat above freezing point by evaporation of the refrigerant.

The expansion valve is preferably set so that the smaller chamber is maintained at temperatures around 0° F., for example, for freezing foods such as vegetables, fruits, chickens etc. and/or maintaining them in the frozen state for indefinite periods, whilst the larger chamber is maintained at temperatures in the region of 40° F., for example, for the short term storage of products such as milk, eggs, fats and the like.

One construction of domestic refrigerator in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective frontal view of the refrigerator, and

Figure 2 is a diagrammatic view of the refrigerating system as seen from the rear of the refrigerator and illustrating the two separate components of the evaporator which is in the form of two coils in series.

Referring to the drawings, the cabinet 10 of the refrigerator is formed of sheet metal and is of substantially rectangular shape, comprising a relatively large chamber 11 occupying approximately half the volume of the cabinet, that is to say substantially the

complete space on one side of the vertical line of the front 12 of the cabinet, while the space on the other side is occupied by an upper chamber 13 of considerably smaller dimensions beneath which the power unit 14 of the refrigeration system is disposed.

As shown in Figure 2, the refrigeration system is of the vapour compression type and comprises an electric motor 15 and compressor 16 of any desired or normal construction. The compressed refrigerant from the delivery side of the compressor is passed through a condenser 17 and then upwardly through a pipe 18 and filter 19 to the vicinity of the smaller chamber 13 where the pipe has an expansion valve 20 connected therein, the pipe then passing to the front of the smaller chamber and forming the first or larger capacity evaporator coil 21 which is wound round the outside of the smaller chamber from one end to the other. Thereafter the refrigerant is led by a pipe 22 into the upper portion of the larger chamber 11 where it passes into the second evaporator coil 23 which is of smaller capacity and is constructed on the usual lines. Thence the refrigerant gas passes downwardly by means of a pipe 24 to the suction side of the compressor 16 to complete the circuit.

The expansion valve 20 is set so that the temperature of evaporation of the condensed refrigerant is substantially below that in a normal domestic refrigerator, for example  $-10^{\circ}$  F., and the first evaporator coil 21 wound round the smaller chamber 13, which is preferably constructed of tinned copper, is soldered or otherwise positively secured thereto so that absorption of heat from the smaller chamber occurs by conduction due to the metal to metal contact.

The second evaporator coil 23 in the larger chamber 11 is disposed around an open-ended receptacle 25 secured to the top of the chamber and arranged to contain the usual freezing trays 26. A thermostatic switch 27 connected by a capillary tube 28 to the second evaporator coil 23 is provided at the front upper end of the receptacle 25 to cut out the electric motor 15 when the temperature in the larger chamber 11 is at the required value. It will be understood that as the first evaporator coil 21 is arranged immediately after the expansion valve 20 there will be a greater absorption of heat from the smaller chamber 13 than from the larger chamber 11. Moreover the length of the first evaporator coil 21 is greater than that of the second evaporator coil 23 and consequently the smaller chamber 13 is maintained at a substantially lower temperature than the larger chamber 11 and forms a "deep freeze" chamber. The cooling capacities of the evaporator coils 21, 23 and the

volumes of the chambers 13, 11 respectively may be so chosen, for example, that the temperatures in the two chambers will be approximately  $0^{\circ}$  F. and  $40^{\circ}$  F., the temperature in the larger chamber 11 thus corresponding substantially to that of the normal domestic refrigerator unit.

The front 12 of the cabinet 10 has substantially rectangular openings 29, 30 therein to provide access to the front ends of the larger refrigerator chamber 11 and the smaller or "deep freeze" chamber 13. The openings 29, 30 have radiused corners and the metal at the edges of the openings is pressed inwardly to form flanges on which the two chambers 11, 13, complete with their rear end walls but open at the front, are spigoted and retained by flush-headed screws 31 which pass through the flanges and chamber walls, the chambers extending rearwardly into proximity with the rear wall of the cabinet 10. Heat-insulating material is secured to the exterior walls of the chambers 11, 13 so that they are insulated from the outer cabinet 10 and from each other, it being preferable to provide a greater depth of insulating material for the "deep freeze" chamber than for the larger chamber. Hinged doors 32, 33 are provided in the front 12 of the cabinet 10 to close the access openings 29, 30 at the front ends of the two chambers 11, 13, the doors being lined with heat-insulating material and being provided with clamp type fastenings 34 which pull the doors inwardly against rubber seals 35 secured thereon. Removable trays 37 are arranged within the lower part of the larger chamber 11 which rest on rubber covered pegs 38 secured to the inside walls of the chamber.

A removable panel 36 secured by means of spigots and sockets is provided in the front 12 of the cabinet below the "deep freeze" chamber 13 to enable access to be had to the power unit 14 of the refrigeration system. The complete cabinet is mounted on wheel or ball castor devices to facilitate movement.

In an alternative construction the arrangement may be such that the "deep freeze" chamber 13 is only accessible through the normal refrigerator chamber 11 and this may be achieved by providing an intercommunicating door between the two chambers.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A refrigerator the cabinet of which includes two chambers of different sizes spaced apart and having separate closure means, such chambers being served by a single refrigerating system having its evaporator

formed as two separate components of different volumetric capacities connected in series with the larger capacity component associated with the smaller chamber and the smaller capacity component associated with the larger chamber, the refrigerating system being arranged in such manner that the refrigerant passes from an expansion valve to the larger capacity component and thence through an unrestricted passage to the smaller capacity component whereby the smaller chamber is maintained at a temperature below freezing point and the larger at a temperature somewhat above freezing point by evaporation of the refrigerant.

2. A refrigerator according to Claim 1, wherein the expansion valve is set so that the smaller chamber is maintained at temperatures around 0° F., for example, for freezing foods such as vegetables, fruits, chickens etc. and/or maintaining them in the frozen state for indefinite periods, whilst the larger chamber is maintained at temperatures in the region of 40° F., for example, for the short term storage of products such as milk, eggs, fats and the like.

3. A refrigerator according to Claim 1 or 2, wherein the separate components comprise evaporator coils, the larger capacity coil of which is wound around the outside of the smaller chamber substantially from one end to the other.

4. A refrigerator according to Claim 3, wherein the coil wound round the smaller chamber is soldered, brazed or otherwise positively secured thereto so that the absorption of heat from the smaller chamber occurs by conduction due to the metal to metal contact.

5. A refrigerator according to Claim 3 or 4, wherein the power unit of the refrigerating system is of the electrically-driven vapour compression type and the evaporator coil in the larger chamber is disposed around a receptacle in the chamber, a thermostatic switch being provided in association with the said evaporator coil to cut out the elec-

tric motor when the temperature in the larger chamber is at the required value.

6. A refrigerator according to any of Claims 3 to 5, wherein the cooling capacities of the evaporator coils and the volumes of the chambers are so chosen that the temperatures in the smaller chamber and the larger chamber will be approximately 0° F. and 40° F. respectively.

7. A refrigerator according to any of the preceding claims, wherein the cabinet is of substantially rectangular shape and comprises a relatively large chamber occupying approximately half the volume of the cabinet comprising substantially the complete space on one side of the vertical central plane of the cabinet, while the space on the other side is occupied by an upper chamber of considerably smaller dimensions beneath which the power unit of the refrigeration system is disposed.

8. A refrigerator according to any of the preceding claims, wherein the cabinet is made of metal and openings having hinged doors are provided in the front thereof to allow access to the front ends of the chambers, the metal at the edges of the openings being pressed inwardly to form flanges on which the two chambers, complete with their end walls but open at the front, are spigoted so that they extend rearwardly into proximity with the rear wall of the cabinet.

9. A refrigerator according to any of the preceding claims, wherein both chambers are insulated from the outer cabinet and from each other, greater insulation being provided for the smaller chamber than the larger chamber.

10. A refrigerator having its parts constructed, arranged, and adapted to operate substantially as herein described, with reference to the accompanying drawings.

Dated this 2nd day of May, 1949.

ARTHUR R. DAVIES,

Chartered Patent Agent,

Royal Chambers, Promenade, Cheltenham.  
Agent for the Applicants.

This Drawing is a reproduction of the Original on a reduced scale

653,760 COMPLETE SPECIFICATION

SHEET 1

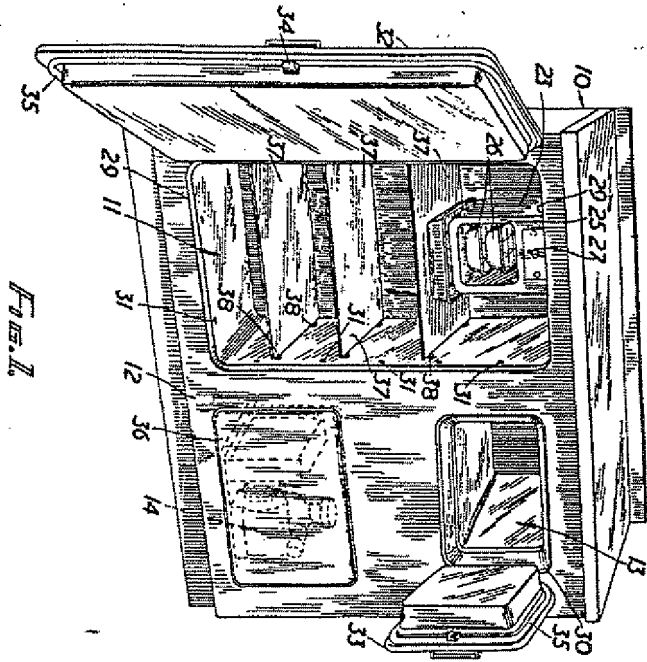


Fig. 1.

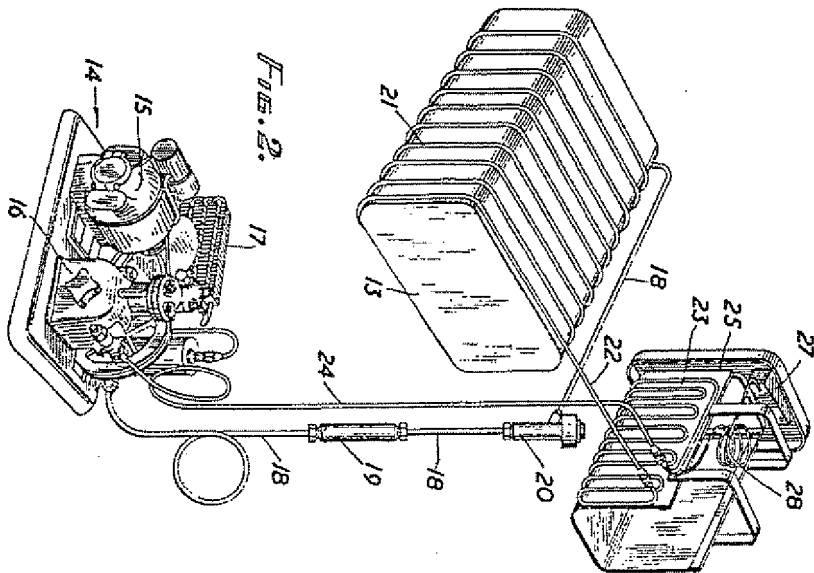


Fig. 2.

2 SHEET  
SHEET

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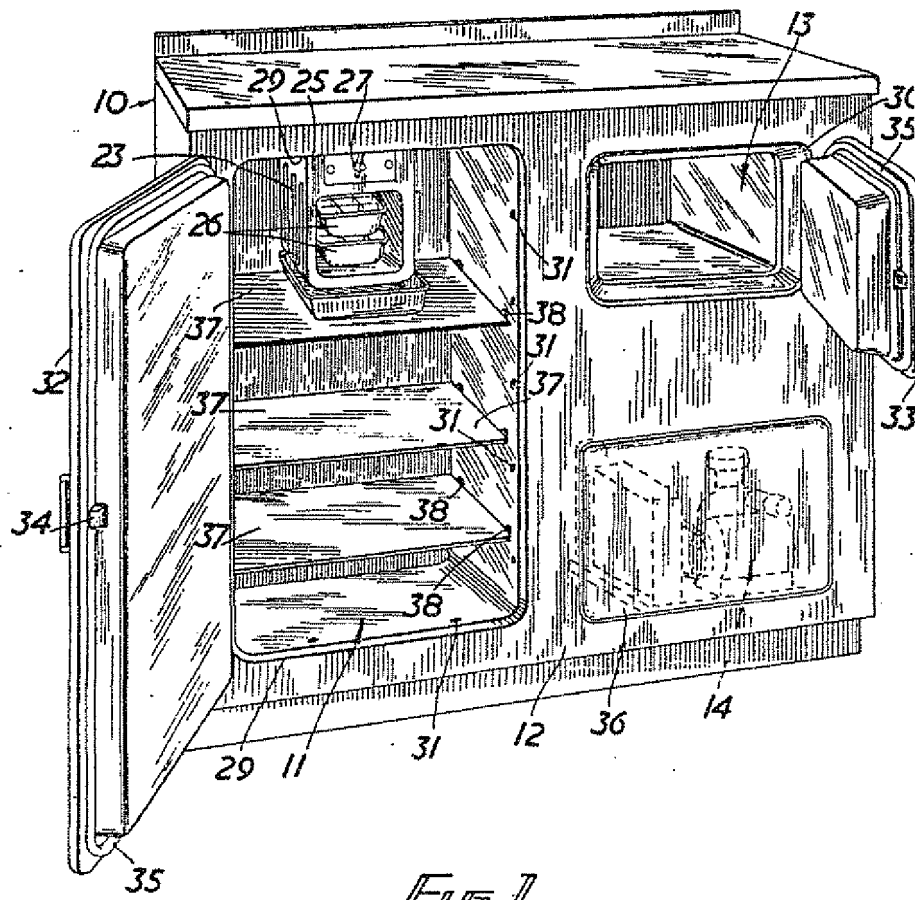


FIG. 1.

